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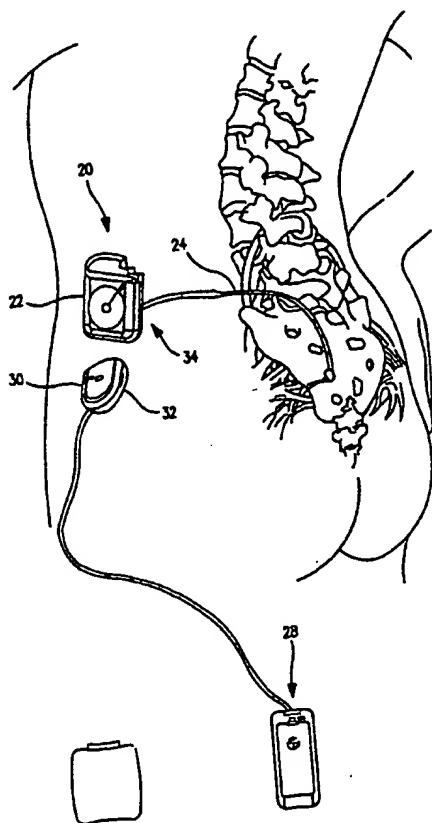
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[Continued on next page]

(54) Title: AN IMPLANTABLE MEDICAL DEVICE WITH AREGARDING COIL MAGNETIC SHIELD



(57) Abstract: A rechargeable implantable medical device with a magnetic shield placed on the distal side of a secondary recharging coil to improve recharging efficiency is disclosed. The rechargeable implantable medical device can be a wide variety of medical devices such as neuro stimulators, drug delivery pumps, pacemakers, defibrillators, diagnostic recorders, and cochlear implants. The implantable medical device has a secondary recharging coil carried over a magnetic shield and coupled to electronics and a rechargeable power source carried inside the housing. The electronics are configured to perform a medical therapy. Additionally a method for enhancing electromagnetic coupling during recharging of an implantable medical device is disclosed, and a method for reducing temperature rise during recharging of an implantable medical device is disclosed.

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/18926

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61N1/378 A61N1/36

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61N A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 071 032 A (SCHULMAN JOSEPH H) 31 January 1978 (1978-01-31)  the whole document	1-3,6,7, 9,10,17, 22-28, 30,31, 33,35, 37-41, 43,45
X	US 4 041 955 A (KELLY FRANK L ET AL) 16 August 1977 (1977-08-16)  the whole document	1-3,6,7, 9,10,17, 22-25, 30,31, 33,35, 37-41, 43,45

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 888 260 A (FISCHELL ROBERT E) 10 June 1975 (1975-06-10)  the whole document	1-3, 9, 19, 20, 22-25, 30, 31, 33, 37, 39, 43, 45
Y	WO 99 44684 A (BORZA MICHAEL A ; DEW ENGINEERING AND DEV LIMITE (CA)) 10 September 1999 (1999-09-10)  the whole document	1-3, 5-7, 9, 10, 17-20, 22-28, 30, 31, 33, 35-41, 43, 45
Y	WO 00 01442 A (ABIOMED INC) 13 January 2000 (2000-01-13)  the whole document	1-3, 5-7, 9, 10, 17, 20, 22-28, 30, 31, 33, 35, 37-41, 43, 45
Y	US 3 357 434 A (ABELL GURDON R) 12 December 1967 (1967-12-12) the whole document	18, 36
Y	US 4 186 749 A (FRYER THOMAS BY) 5 February 1980 (1980-02-05) the whole document	19

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/18926

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4071032	A	31-01-1978	CA 1097744 A1 DE 2703628 A1 FR 2357237 A1 IT 1077901 B JP 1347720 C JP 52113084 A JP 61012702 B	17-03-1981 04-08-1977 03-02-1978 04-05-1985 13-11-1986 21-09-1977 09-04-1986
US 4041955	A	16-08-1977	NONE	
US 3888260	A	10-06-1975	AU 5742673 A CA 1020633 A1 CH 583569 A5 CH 583570 A5 CH 578355 A5 DE 2331499 A1 FR 2190403 A1 GB 1419532 A GB 1419533 A GB 1419531 A IL 42616 A IT 985803 B JP 49064283 A NL 7308947 A ZA 7304385 A	09-01-1975 08-11-1977 14-01-1977 14-01-1977 13-08-1976 17-01-1974 01-02-1974 31-12-1975 31-12-1975 31-12-1975 31-10-1976 20-12-1974 21-06-1974 02-01-1974 25-09-1974
WO 9944684	A	10-09-1999	US 6058330 A AU 2707099 A WO 9944684 A1	02-05-2000 20-09-1999 10-09-1999
WO 0001442	A	13-01-2000	US 6324431 B1 AU 5090599 A WO 0001442 A2	27-11-2001 24-01-2000 13-01-2000
US 3357434	A	12-12-1967	NONE	
US 4186749	A	05-02-1980	NONE	

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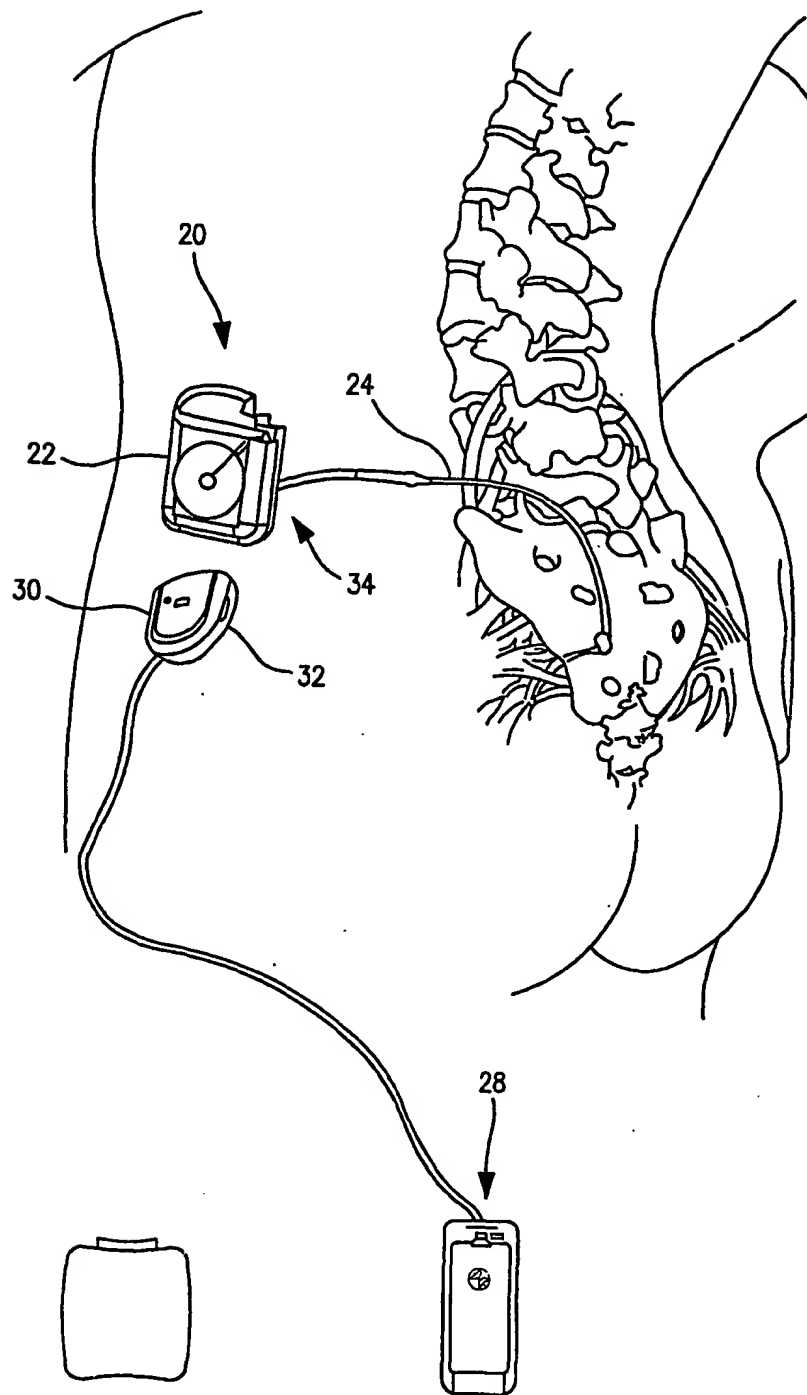


FIG. 1

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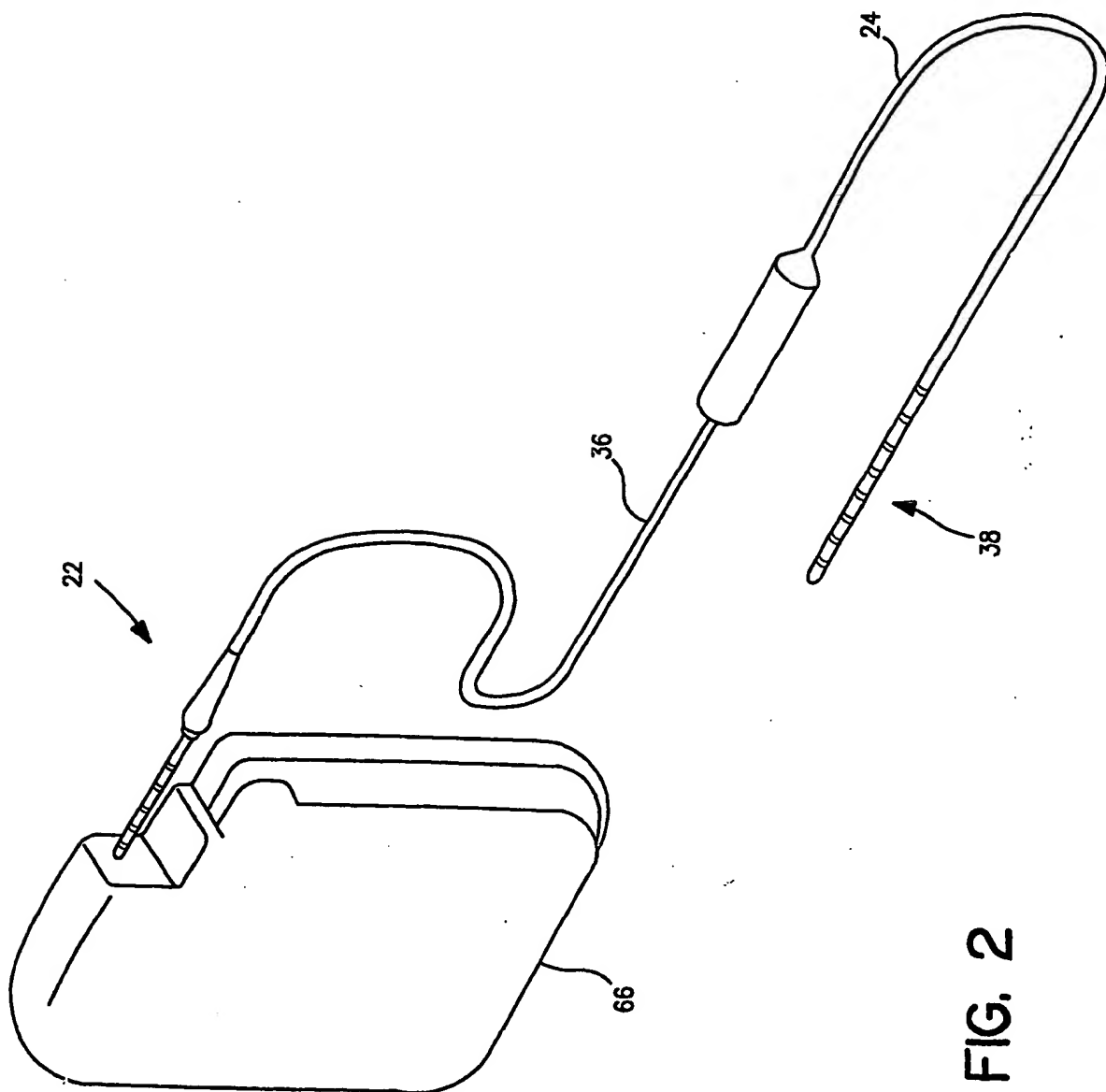


FIG. 2

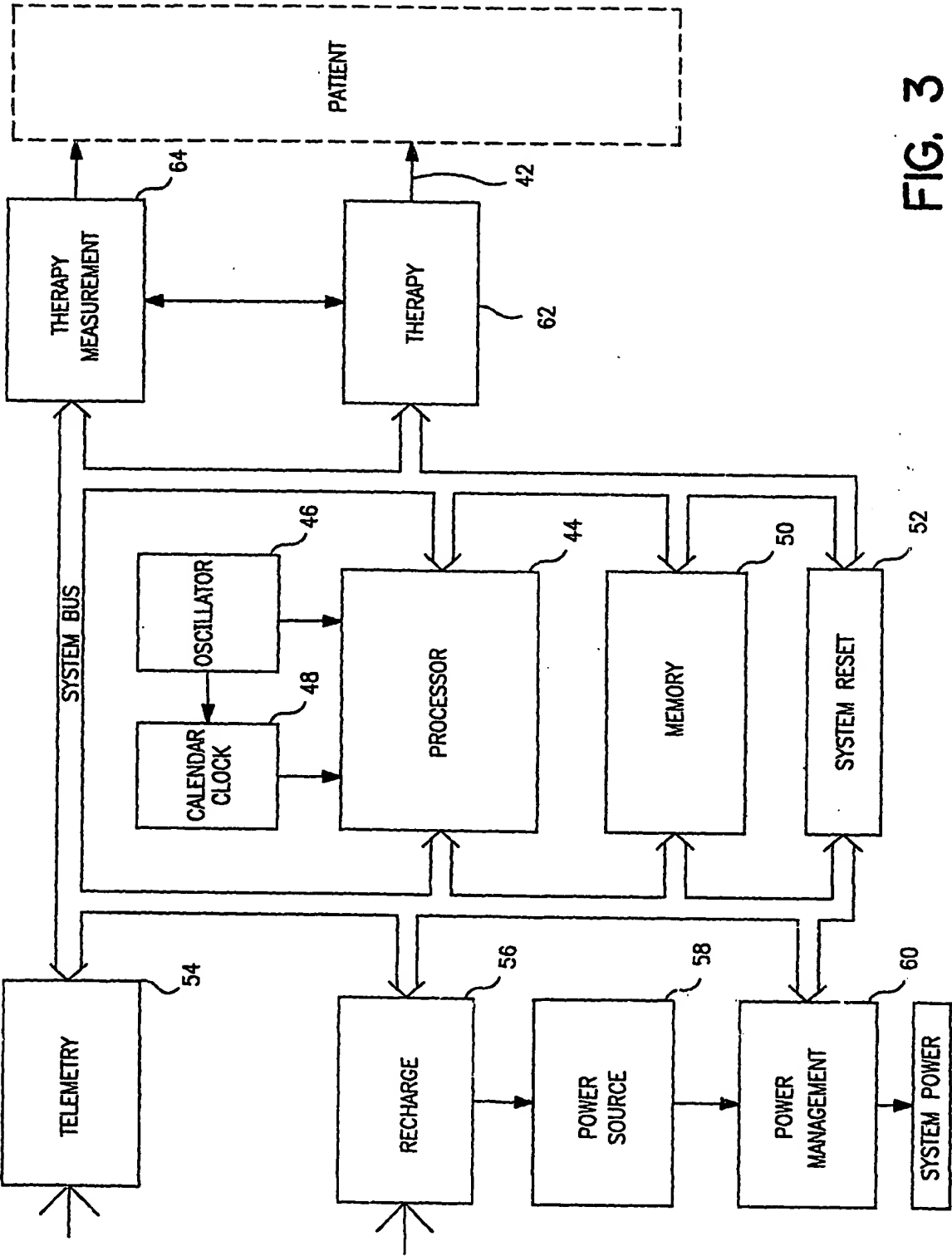


FIG. 3



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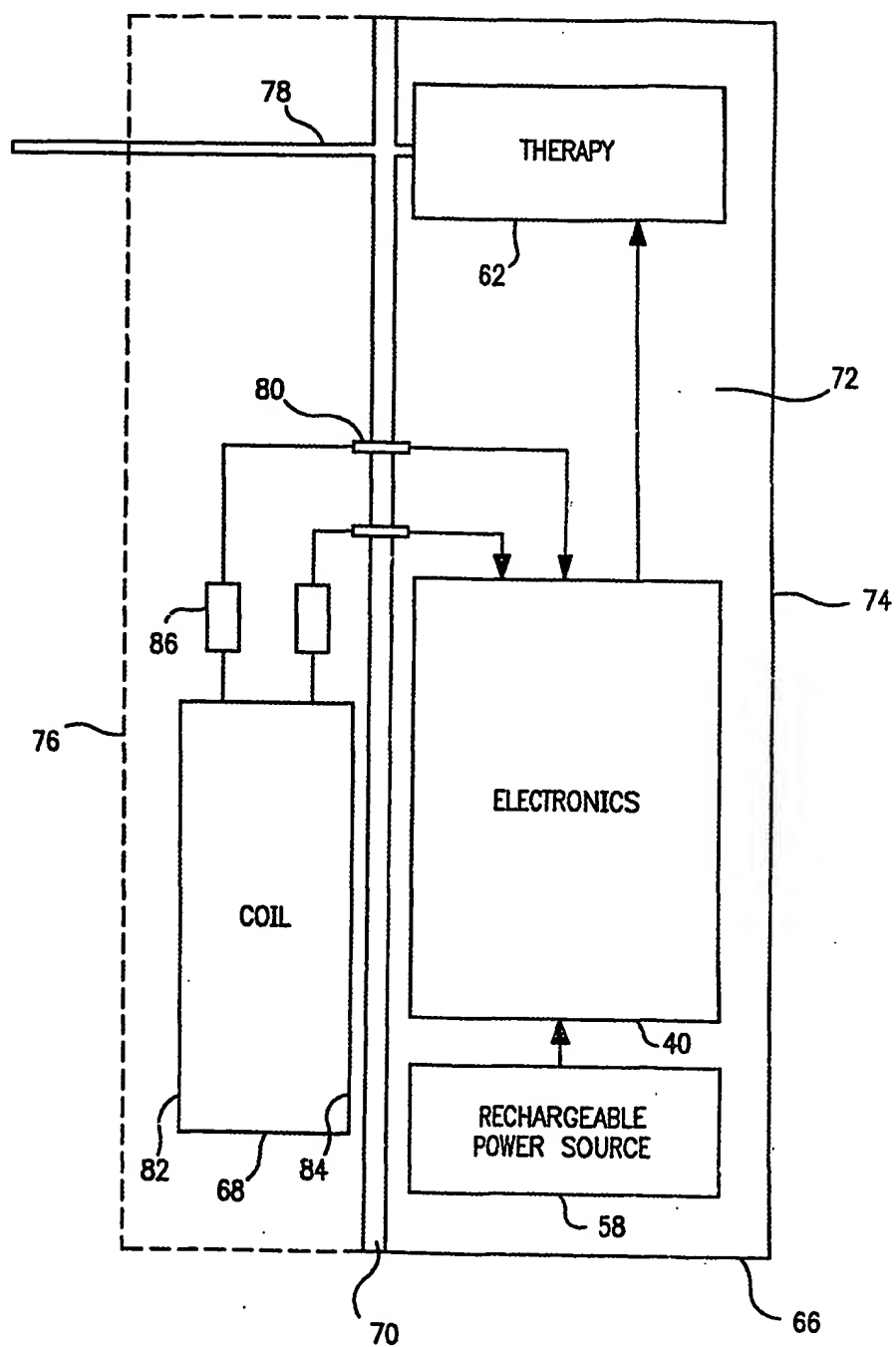


FIG. 4a

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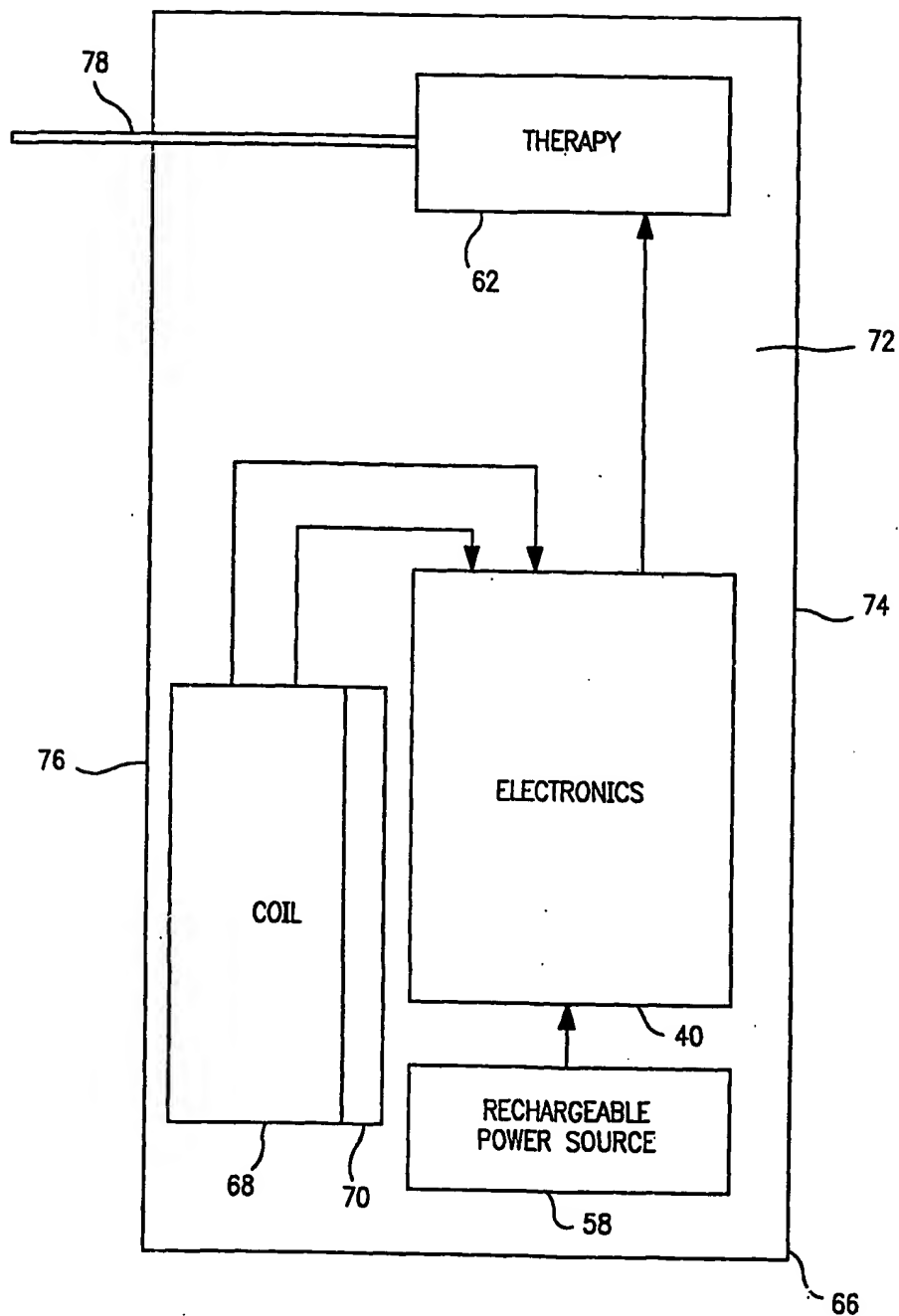


FIG. 4b

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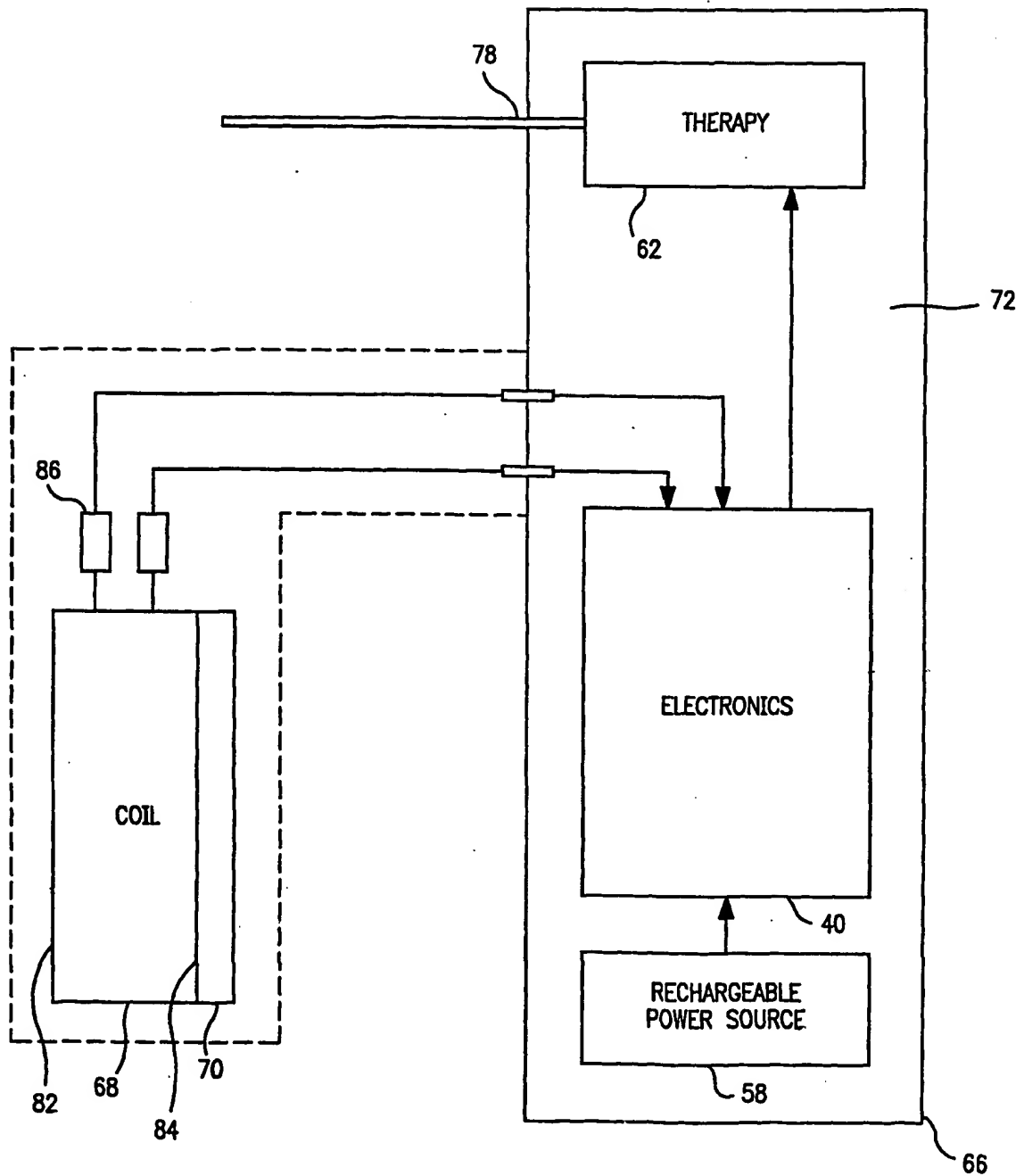


FIG. 4c

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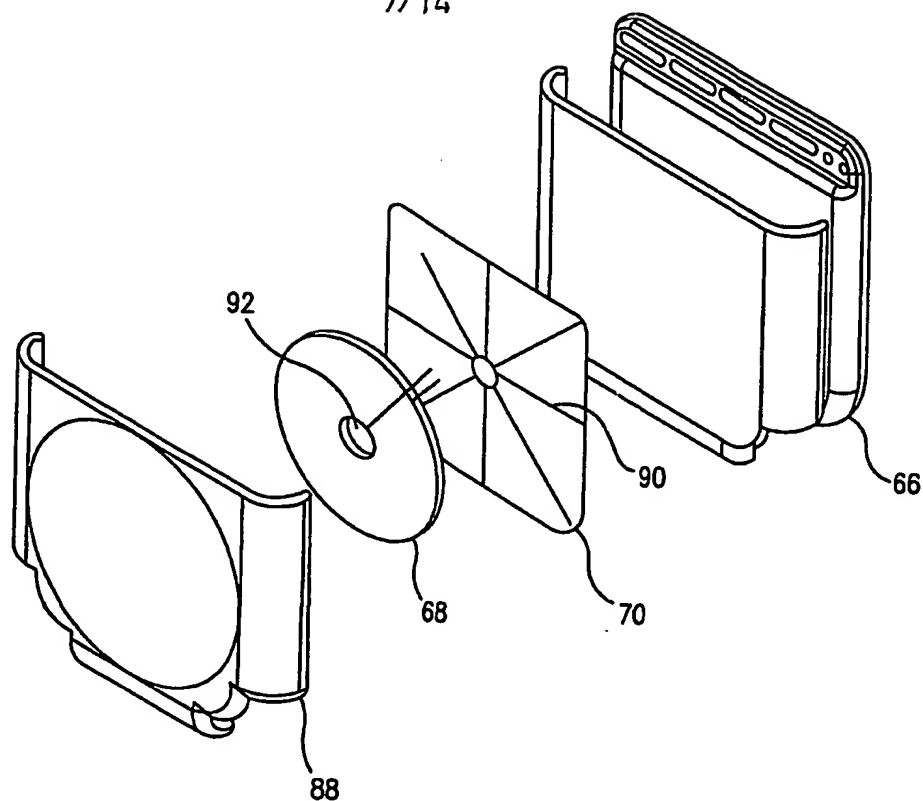


FIG. 5

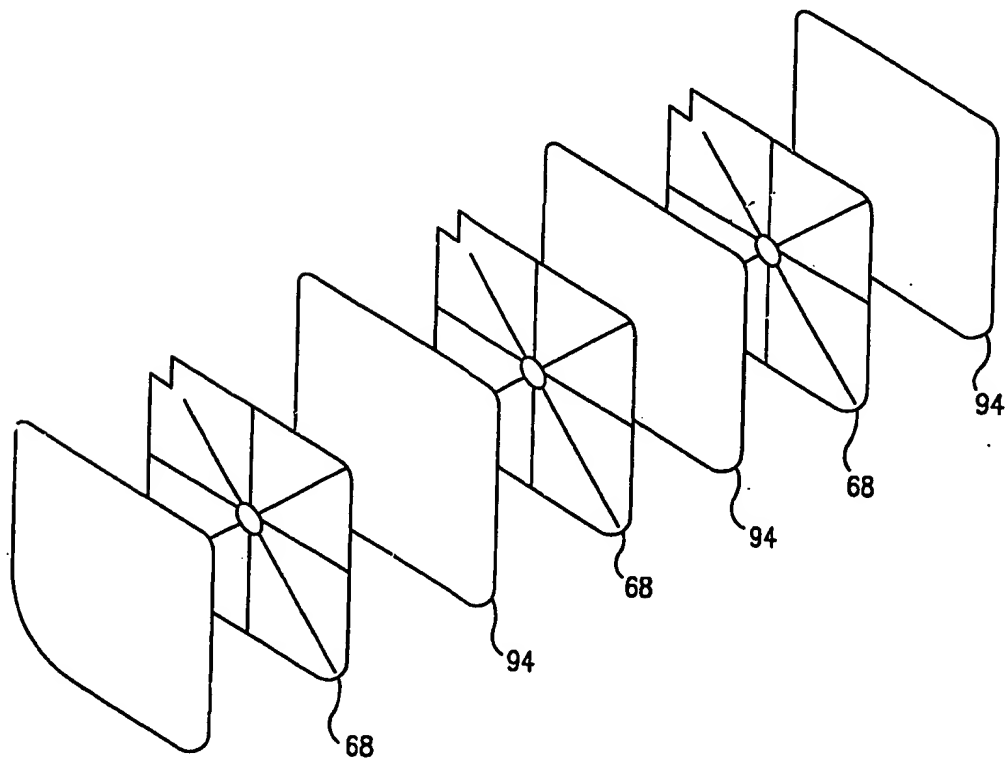


FIG. 6

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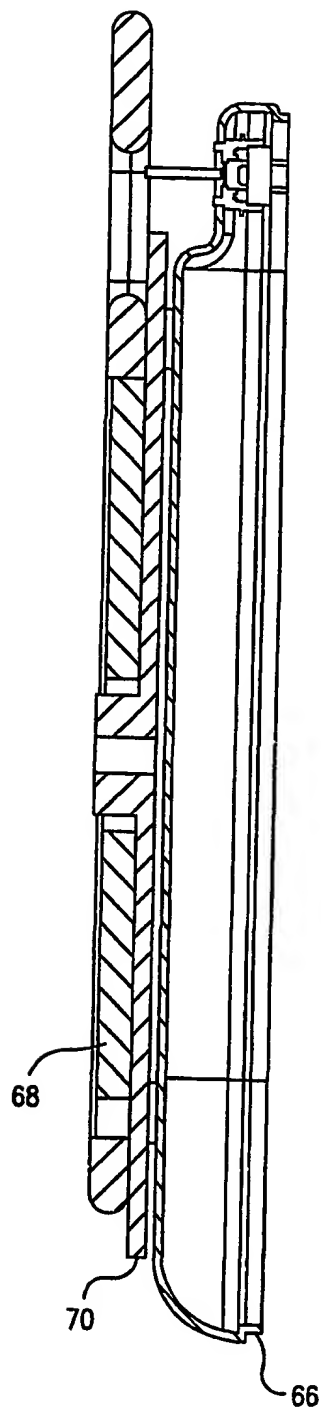


FIG. 7

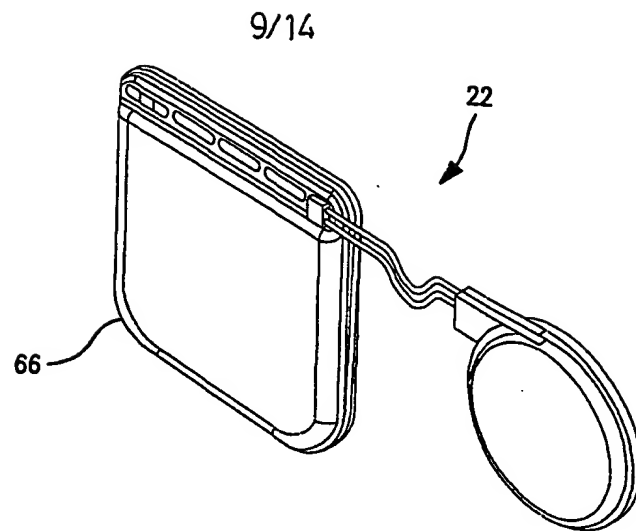


FIG. 8a

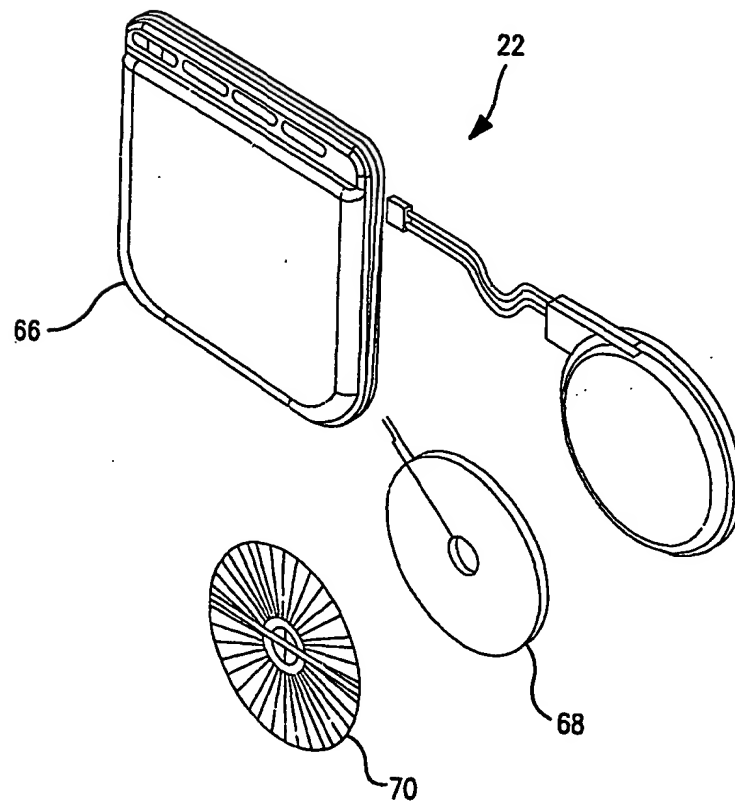


FIG. 8b

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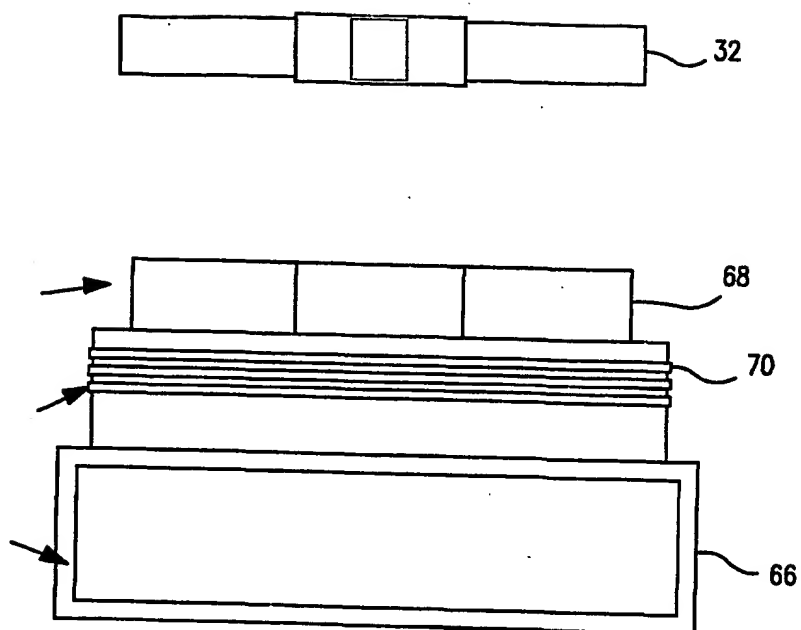


FIG. 9a

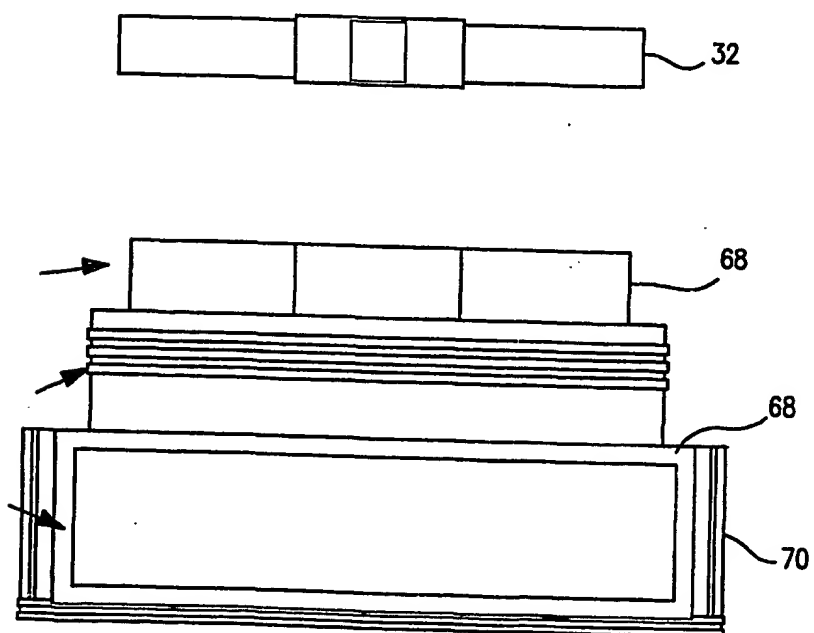


FIG. 9b

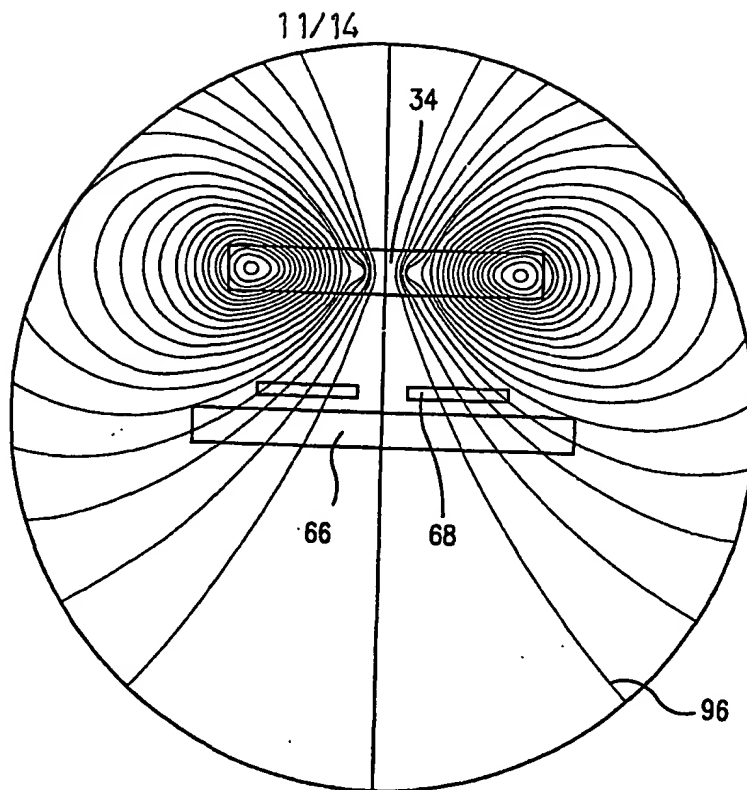


FIG. 10a

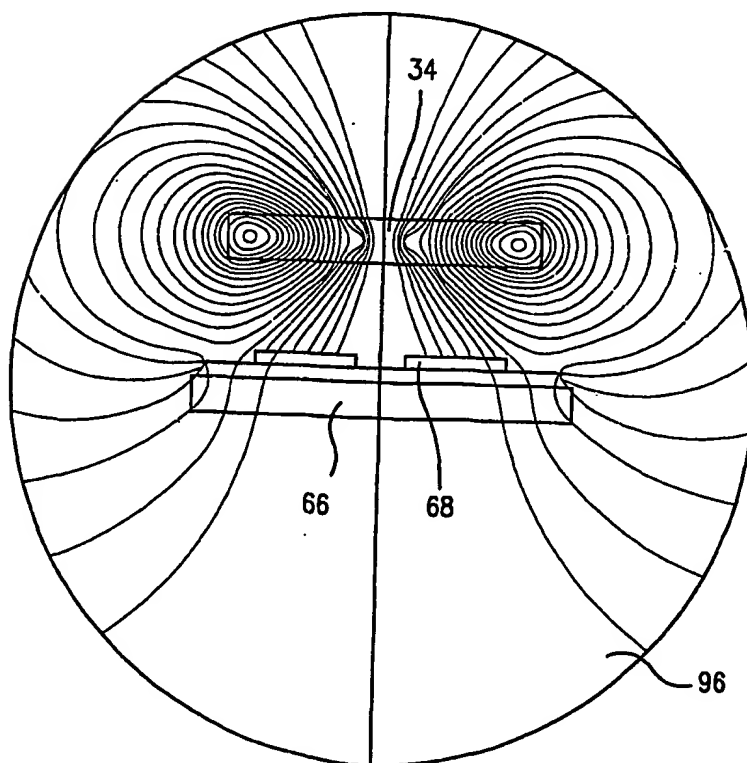


FIG. 10b



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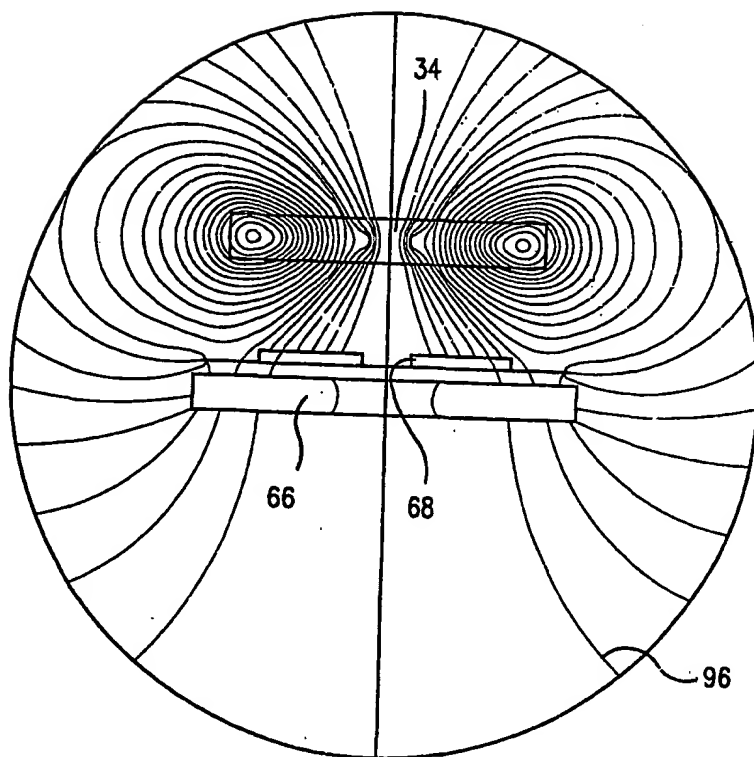


FIG. 10c

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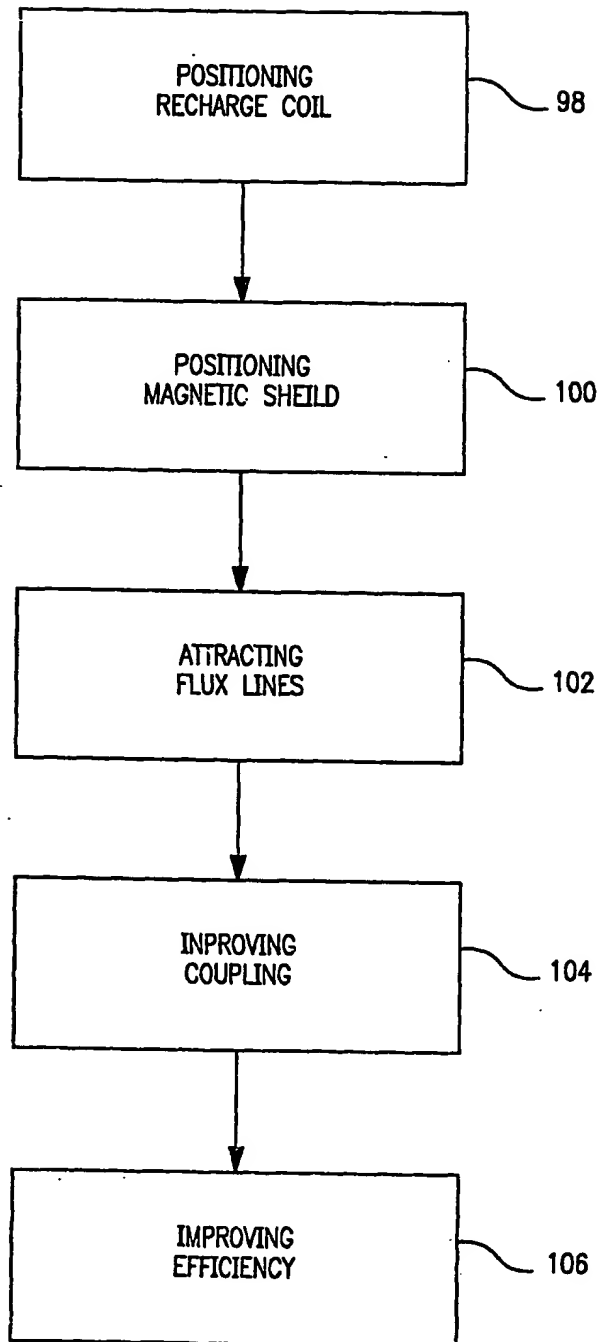


FIG. 11

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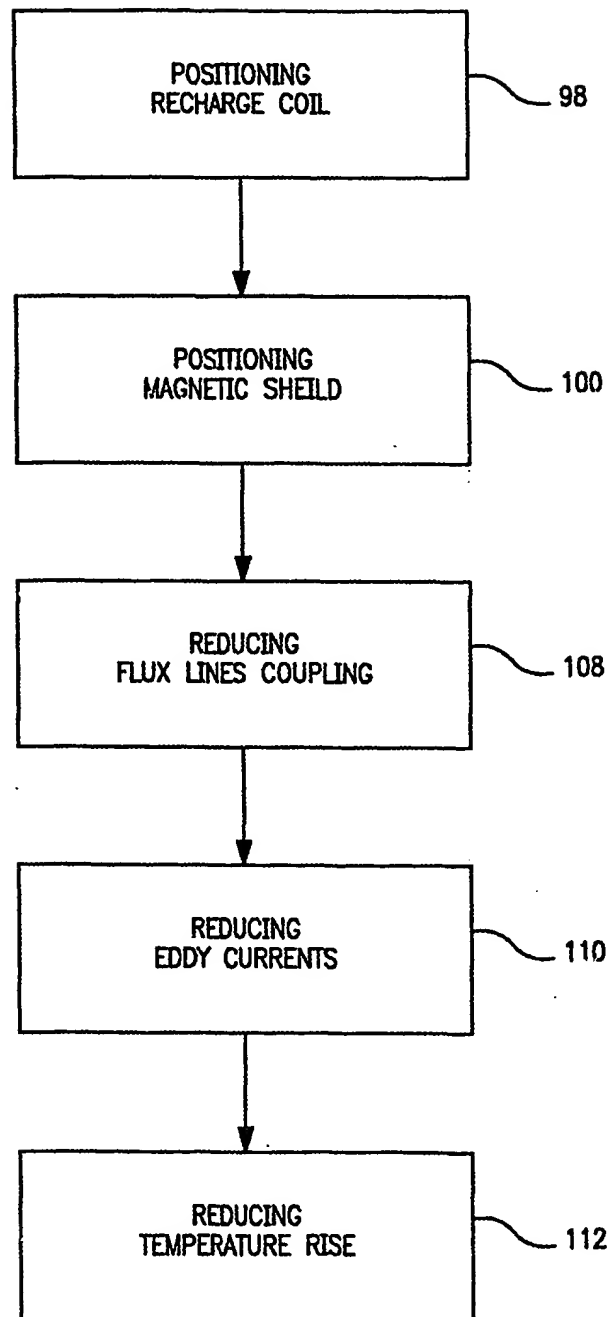


FIG. 12